Methodological considerations in forecasting Saudi Arabian economic growth

Robert E. Looney

The author surveys a number of factors responsible for Saudi Arabian economic growth and concludes that, contrary to popular belief, the petroleum sectors have had more than just a short-run transitory stimulating impact on the domestic economy. It appears that changes in the level of exports (and resulting government expenditures) have a number of impacts on the non-oil sector of the economy which take some time for their full effect to be felt. Government expenditures have become somewhat independent of current oil exports, so the current oil glut and falling revenues for Saudi Arabia are not likely to be translated into slower non-oil income growth.

Keywords: Economic growth; Forecasting; Saudi Arabia

Robert Looney is with the Department of National Security Affairs at the Naval Postgraduate School, Monterey, CA 93940, USA.

During the 1970s the world economy was dominated by low growth rates and rapid inflation. With the exception of Japan among the industrialized nations, and Singapore, Taiwan, Brazil and South Korea among the developing nations, the world's economies experienced little economic growth. Even among the oil producing and exporting countries, economic development was erratic and below expectations. Nigeria and Mexico now face major crises. Several OPEC members have had to borrow in the world money markets to cover balance of payment deficits and continue the planned pace of economic development.[1] The UK has been unable to reverse its economic decline, despite the revenues it has received from the sale of North Sea Oil.

Saudi Arabia has been the exception.[2] From 1970 to 1980 two five year development plans were successfully completed and a third five year plan was implemented. The magnitude of the change wrought during the 1970s was astounding – during the first plan period (1970–75) the 13.5% growth rate of gross domestic product (GDP) exceeded the projected GDP rate of 9.8%, while during the second five year plan (1975–80) the non-oil sector grew at an annual rate of 15.1% instead of the projected 13.3%.

As a result of this expansion the non-oil sector's share in GDP increased for the first time – measured in current dollars the non-oil share in GDP rose from 20.7% to 37.8% while the percentage share of oil fell from 79.3% to 62.2% during the same time period.

In spite of Saudi Arabia's many current economic successes there are reasons to believe that the era of high Saudi economic growth has come to an end. Saudi Arabia's economy is presently (1983) seen to be at something of a watershead for the following reasons:

- The kingdom is nearing the completion stage of the massive construction and infrastructure projects begun in the mid 1970s.
- Oil production and revenues have recently fallen off sharply, ie in 1981 Saudi Arabia was pumping oil at over 10 million bbl/day constituting nearly 40% of OPEC's output at the time and over 20%

[1] Ramon Knauverhase, 'Saudi Arabia: fifty years of change', *Current History*, January 1983, p 19. All data on Saudi Arabia are from the Saudi Arabia Monetary Agency, *Annual Report*, various issues.

[2] A detailed account of the country's recent growth record is given in Robert Looney, *Saudi Arabia's Growth Potential*, Lexington Books, Lexington, MA, 1982.

0301-4207/84/020109-16$03.00

of the non-Communist world's output. In the first quarter of 1983 its average had dropped to 3.67 million bbl/day or 24% of a greatly diminished OPEC flow and 8% of a significantly reduced global total.

The slowdown in economic activity is to be expected for a number of reasons:

- The government claims that the bulk of five-year expenditure volumes has already been committed, a large part on projects rolled over from the second plan.
- Average annual growth targets for the 1980–85 period have been greatly exceeded in the first two years.
- The administration is supposed to be pressing through with a deliberate programme to limit the number of expatriate workers, even at the cost of a slowdown in project implementation; and revenue expectations might be supposed to introduce a degree of caution following the experience of budget deficits in the late 1970s.

Given these developments the following sections discuss a number of methodological issues that must be taken into account before making any assessment of the country's future pace of economic expansion. These include:

- Determining the options open to the kingdom with regards to development strategy.
- Selecting, given the preferences of the Saudi authorities, the general growth strategy that is likely to characterize the country's pattern of economic development in the near future and in particular the feasibility of a slow-down in economic growth.
- Identifying the likely levels of oil production and revenues together with their impact on the economy. This step entails quantifying the mechanisms which have been largely responsible for Saudi Arabian growth.

The long-run Saudi development strategy

The cornerstone of Saudi Arabia's long-run strategy of development is now well established. In essence, the strategy consists of the timed channelling of resources earned by the petroleum sector into expanding the non-oil production base.[3] This in turn has involved anticipating several likely eventualities.

First, an expanding economy requires an increasing flow of resources to maintain its momentum, given: (1) estimates of known oil reserves; (2) the likely expansion of needs for domestic energy sources, and (3) the plans to supply the petrochemical industry and refineries with enough crude oil and gas to meet domestic and export requriements.

Second, because oil reserves are not infinite, Saudi Arabia has begun to prepare for the day when its hydrocarbons will have been economically depleted. Saudi Arabia still has by far the largest reserves of crude petroleum in the world – more than six times those of the USA. While there are probably around 530000 million barrels of oil remaining in the country's fields, only about half of this is economically recoverable (possible reserves) with current technology. The proved reserves are currently estimated at 163350 million barrels and about 50% of this oil consists of light crude (340 API). In addition, Saudi Arabia's natural gas reserves, estimated at 93.23 trillion cubic feet, are

[3]A point made by Timothy Sisley, 'Saudi Arabia: the contemporary political scene', in Centre for Arab Gulf Studies, University of Exeter, *State, Economy and Power in Saudi Arabia*, a symposium held on 4–7 July 1980, p 5.

very substantial by world standards. Nevertheless, even these vast amounts of hydrocarbons are finite. If the rate of extraction of oil returns to around 10 million bbl/day production in the four main producing fields – Ghawar, Abquiq, Berri and Safaniyah – will start to decline in the late 1980s and early 1990s. Considerable new investment will then be required to develop new fields if the overall level of output is not to decline. On the assumption that this investment is made, it should be possible to maintain production until the middle of the next century. Thus, in about 70 years from now the overall level of petroleum production will gradually begin to fall off.[4] Long before then, the investment requirements needed to maintain production will have resulted in an end to the present pattern of relatively easy growth (probably around the end of this century).

Third, the longer term problem of economic diversification is intimately tied with Saudi Arabia's strategy of economic development and the possibilities for developing an international comparative advantage in the production of certain commodities. Of the productive sectors – agriculture, industry and mines, and services – only certain industrial and mining activities (given the country's high wage structure and distance from markets) offer even the slightest possibility of becoming significant earners of foreign exchange. The possibilities for growth in the most traditional sectors, such as agriculture and livestock, are extremely limited, due not only to the shortages of water and arable land but also, and perhaps more importantly, to the sufficient number of Saudis who are willing to pursue a career in farming.

Economies of scale also preclude Saudi Arabia from undertaking an efficient, comprehensive import substitution programme. Pending a major breakthrough in technology, local production will continue to meet only a small proportion of domestic needs. In fact, if anything, the gap between domestic production and consumption is likely to increase over time.

Saudi Arabia will have to adjust to an environment where growth will be ever more dependent on the mobilization of domestic resources and alternative (non-crude based) taxes. In other words, the public sector will have to diversify its revenue sources, and the private sector will have to reach a level of sophistication capable of generating a large proportion of its own investment funds. Establishing the elimination of oil as an adequate and easy source of savings will necessitate improvements in productive efficiency and a more rational allocation of domestic investment than is currently taking place.

Finally, given the limited number of linkages within its productive structure, any increase in Saudi Arabia's GDP will require increased imports to maintain the economy's growth momentum. Thus, by around 2005–2010 Saudi Arabia will have had to develop a number of new and viable export industries, capable of earning enough adequate foreign exchange to meet import needs. While this situation is generally true of all non-renewable resource exporters, it is especially true for Saudi Arabia; its small domestic market, the limited non-petroleum resource base, and shortages of Saudi workers preclude developing a number of industries capable of assuring the country greater domestic self-sufficiency. This applies particularly to the establishment of a group of capital goods industries to enable domestic entrepreneurs to channel their domestic savings into investment in plant and capacity irrespective of possible foreign exchange shortages.[5]

[4]See H.G. Hambleton, 'The Saudi Arabian petrochemical industry: its rationale and effectiveness and the social political implication', in Centre for Arab Gulf Studies, University of Exeter, *State Economy and Power in Saudi Arabia,* a symposium held on 4–7 July 1980, p 1, for documentation on these forecasts.

[5]This is done to avoid the implications of the foreign exchange constraint on growth as described in Hollis Chenery and Alan Strout, 'Foreign economic assistance and economic development', *American Economic Review,* September 1966, pp 679–733.

Whether oil will enable Saudi Arabia to cope with these eventualities will in the long run depend almost entirely on the government's expenditure strategy and the response of the private sector.

Preferences of the government's short-run growth strategy

If there is a more or less consistent pattern in the actions of any government, one may conclude that this pattern presents policy – whether or not it accords with public statements. The only conclusion about the Saudi leaders' policy is that they wish to spend the oil revenue as rapidly as is feasible.[6] This was the policy during the 1960s and despite far higher levels of income in the 1970s the *modus operandi* remained essentially unchanged. Between 1970 and 1973 Saudi production and exports doubled, with the biggest increment taking place in 1973 – despite a cutback in the last quarter of the year. Oil revenues increased even more rapidly, since prices were rising, beginning in 1971.

The price escalation in 1973–74 raised Saudi revenues to unprecedented dimensions. This was the period when foreign analysts were projecting huge OPEC financial surpluses – accumulating into the 1980s or beyond – with the Saudis capturing the lion's share. The widespread view amongst analysts was that the Saudis (and other major Middle Eastern oil exporters with small populations) were 'small absorbers' of revenues, unable to spend all the money they had made and, generally, their 'absorptive capacity was very limited'.

In actuality the Saudis have managed to spend oil revenues at rates even greater than that of Iran under the late Shah,[7] and Saudi expenditure performance lends credence to the argument that the behaviour of governments with respect to income and expenditures is not very different from that of individuals, ie when incomes rise, and the higher incomes are viewed as either permanent or long term, it is almost certain that individual expenditure increases will not be far behind. When oil revenues rose dramatically in 1974 the Saudis adopted, almost immediately, a massive Five-Year Plan designed, firstly, to raise the living standards and educational and health services of wide segments of the population; secondly, to improve the economy, especially through major industrial projects to reduce the country's almost total dependence on oil revenues; and, thirdly, to effect a significant expansion and modernization of the armed forces.[8]

While permanent income theory may hold some validity for expanding oil revenues, it is not clear however that it is equally applicable in explaining the Saudi response to falling revenues. While the Saudis might curb the growth rates of expenditures and imports, a cutback in real terms would pose serious dangers for their regime. No official data on income distribution are available, but unofficial reports state that 'the inequities in income are perhaps unprecedented in history'.[9] Such reports suggest that middle class elements are complaining 'that too big a proportion of the oil wealth is profiting a minority of entrepreneurs . . . [and] as a result Saudi expectations have become dangerously inflexible.'[10] The sensitivity of Saudi leaders to these problems was exacerbated by the Mecca incident and the violent protest of Shi'ites who reside mainly in the oil producing region.[11]

Recent budgets have brought about the following changes:[12]

- Direct subsidies for food and services were raised by 78% in the 1980–81 budget.

[6]Eliyahu Kanousky, 'The diminishing importance of Middle East oil: a harbinger of the future?', in Colin Legom *et al, Middle East Contemporary Survey, Vol VI, 1980–81*, Holmes and Meier, New York, 1982, pp 377–379.

[7]See, for example, Alan Brown, 'A note on the consumption function in Iran', *Oxford Bulletin of Economics and Statistics*, February 1978, pp 1–8.

[8]Excellent up-to-date discussions of the country's planning efforts are given in Howard Bowen-Jones, 'The third Saudi Arabian five year plan', *The Arab Gulf Journal*, October 1981, pp 55–70; and Ragaei El Mallakh and Dorothea H. El Mallakh, 'The third development plan of Saudi Arabia, 1400–1405/1980–1985 AD', in Ragaei El Mallakh and Dorothea H. El Mallakh, *Saudi Arabia: Energy, Development Planning and Industrialization*, Lexington Books, Lexington, MA, 1982, pp 117–192.

[9]'Saudi Arabia survey', *Financial Times*, 28 April 1980, p X.

[10]Saudi Arabia Supplement, *Financial Times*, 5 May 1981, pp I and V.

[11]Kanousky, *op cit*, Ref 6, p 380.

[12]Edmond O'Sullivan, 'Adapting and surviving in an era of change', Middle East Economic Digest, *Saudi Arabia: Special Report*, August 1982, pp 2–6.

- Allocations for municipal services were increased by one third in the 1980–81 budget.
- The public administration budget was increased.
- The already overdeveloped bureaucracy is to be expanded by an additional 100000 during the 1980–85 plan period.

In a country whose total domestic labour force is less than one million, this last item constitutes a major and costly expansion. This policy is not determined by any need for more public servants but is primarily to provide the kind of white collar jobs preferred by educated Saudis.

Fulfilling Saudi expectations requires a continued investment in infrastructure and in services. To cite but one example, absurdly low prices are charged for electricity, water, gasoline, etc. The result is a rapid growth in consumption which in turn requires further public investment in services.

Foreign aid might be one area where cutbacks could take place, but these are limited and would have only a marginal effect on total spending. According to the balance of payments, actual disbursements of foreign aid (grants plus loans) over the six-year period, 1975–80, averaged $3.6 billion per annum. As a percentage of revenues from oil exports, this figure showed a sharp decline from 11.5% in 1975 to 4.0% in 1980.

Most Saudi economic aid is determined by the country's perception of defense considerations.[13] Aid to Pakistan is to a large extent an indirect payment for the services of thousands of Pakistani personnel in Saudi Arabia. Aid to neighbouring countries, such as the Yemen Arab Republic and Oman, is designed to maintain stability on its borders. Disbursements to Palestinian organizations are important, among other reasons for maintaining the Saudi Royal Family's role in the Arab world and to keep the large number of Palestinian workers in the country relatively quiescent.

In summary, aid allocations seem to be at a level where further reductions are not politically feasible.

Saudi expenditures and imports are therefore related to four factors: (1) the rising expectations of the Saudis, (2) the cost of a rising number of foreign labourers, (3) the commitment to industrialization, and (4) large-scale military and internal security spending. Any serious attempt to cut back spending seriously would clearly be fraught with dangerous consequences for the regime. The five year plan called for budgetary expenditures of $392 billion in April 1981, and a year after the plan was announced the Deputy Minister of Planning stated that actual spending would be 15% higher. The sharp increase in allocations in the 1981–82 budget suggests that expenditures might be at least 25% higher than planned.[14]

It is therefore apparent that the Saudi government will make every effort to avoid an economic recession, however short-lived. The idea of a more permanent slow-down of the economy is also very difficult for Saudi planners to reconcile with the promise of continuous growth in economic activity and high living standards, which are two of the cornerstones of the government's general economic policy. In the short term the government will be well aware that past applications of a brake on government spending in the 1950s, 1960s and 1970s have always tended to have the most detrimental effect on lower income Saudis; strikes and other forms of unrest have occurred and, although the causality implied above can be questioned, there is no doubt that the

[13]John Presley, 'Trade and foreign aid: the Saudi Arabian experience', *The Arab Gulf Journal*, April 1983, pp 61–74.

[14]Edmond O'Sullivan, 'Buoyant economy weathers oil-glut storms', Middle East Economic Digest, *Saudi Arabia Special Report*, August 1982, pp 6–8.

government has good reason to try and avoid even potentially similar economic situations in the 1980s.

But in the 1980s it would not only be the lower income Saudis who would be affected by a decline in government expenditure. There would be a natural fall in private sector confidence and willingness to invest in the productive sectors of the economy; the Saudi businessman is well aware of the importance of government programmes to stimulate demand within the country.[15]

Interaction with the private sector

For the past 10 years the driving force behind the Saudi Arabian economy has been government expenditures on construction contracts. Through government expenditures oil revenues have been deployed both to add to the nation's capital by investments in economic and social infrastructure products and to create consumer demand for a wide range of commodities, ranging from cement to office furniture, from foodstuffs to electronics, and from industrial machinery to motor vehicles.[16]

The Saudi government has sought to ensure that members of the Saudi business community benefit, either as agents putting together contracts, as agents importing goods and services as main or sub-contractors, or as shareholders in banks, transport and other service companies. It required no sophisticated foresight to see that the government could not continue to fuel the economy by expenditures on public sector construction contracts indefinitely, if for no other reason that that there is a physical upper limit to the amount of economic infrastructure that any society requires.

Long before the impact of a dramatic fall in oil revenues began to dawn on the Saudi business community, ministers and officials were warning that the construction sector would begin to decline both in relative and in absolute terms.[17] The sequence of events in Saudi Arabia was as follows:

- Between 1976 and 1980 the oil sector declined as a percentage of GDP from 50.1% to 42.2%.
- Construction remained the second largest contributor to GDP between 1976/1977 and 1980/1981, but the relative share of the sector peaked at 10.9% and has since shown a steady fall, which can be expected to become more pronounced in the immediate future.
- The wholesale and retail trade sector has now become the second largest contributor to GDP, increasing its share from 7.3% in 1976/77 to 12.1% by 1980–81.
- Similarly, transport storage and communications have increased their share of GDP from 4.9% in 1976/77 to 6.3% in 1980/81.

Thus Saudi Arabia, like Kuwait and Bahrain, is developing a service economy in spite of attempts to broaden the industrial base. Even when the heavy industrial plants now being built in Jubail and Yanbu are fully operational in 1986, the service sectors – transport, storage, communication, finance, industrial real estate and business services – are likely to remain the most dynamic.

This is not surprising given the mercantile traditions of the Arabian peninsula, the basic preferences of the people and the narrow market for much local industrial production which can only remain competitive behind protectionist policies.[18]

[15]Ghazi Alqosaibi, 'The industrial development of Saudi Arabia', *The Arab Gulf Journal*, April 1982, pp 5–10..

[16]Alec Thomas, 'Getting to grips with a new economic era', *The Financial Times*, 25 April 1983, p III.

[17]Saudi Arabian Monetary Agency, *Annual Report*, 1401, 1981.

[18]David Sambar, 'Arab investment strategies', *The Arab Gulf Journal*, October 1981, pp 13–22.

More specifically, when the Saudi government appeals to the local business community to pick up some of the burden of future development and to make use of the excellent modern economic infrastructure, as well as of the capital acquired over the last ten years of sustained and dramatic growth to invest in the future of Saudi Arabia, the great majority of Saudi entrepreneurs look to investment in, for example, management maintenance and other service undertakings as well as in banking and other financial services.

Even without a drop in oil revenues, the Saudi economy would have been entering a new phase in the early 1980s. In any case, some of the more traditional Saudi entrepreneurs would have been slow to adapt to the new challenge of business within the country and some of the smaller, less well managed Saudi companies would have gone out of business. Any slow-down causing economic stagnation or consolidation, or even recession, might follow a significant drop in government expenditures and will merely serve to accentuate this underlying trend.

As noted in the previous section, it is by no means certain that the fall in oil revenues will be immediately and automatically translated into a commensurate drop in government expenditure. The government will seek to cushion the economy by drawing down financial reserves. Saudi ministers and officials have always maintained that the growing financial surpluses which sometimes were something of an embarrassment would be needed one day, probably sooner rather than later, to sustain the domestic economy.

The Saudi government has not shown any enthusiasm for the Kuwaiti policy of building a long-term portfolio fund for future generations, and has always sought to keep a sizeable part of its foreign assets in easily marketable instruments.

An IMF figure suggests that the foreign assets of the Saudi Arabian Monetary Agency (SAMA) were marginally in excess of $140 billion at the end of 1982. Bank analysts say that this total is broken down roughly as one third short- and long-term bank deposits, one third longer-term loans to the Japanese, West German and French governments, for example, and various government and corporate bonds, and one third in liquid assets such as IMF contributions, soft loans and loans to, for example, Iraq where early payment is unlikely.

Bankers' estimates put the total of Saudi private setor, including commercial bank, foreign assets at the end of 1982 at about $35 billion.[19]

In the first three months of 1983 SAMA did not renew a number of foreign bank deposits and it is virtually certain that this process will continue. The government also seems to be managing its cash flow by delaying at least some of its payments to contractors. For example, in the first quarter of 1983 the normal payment delay of 30–60 days had been extended to 90–120 days, although some government agencies were continuing to pay promptly..

Fast free spending policies have left a legacy of commitments to ongoing projects which are impervious to threats of budget costs. A momentum of government expenditure has been built up which will take more than one year's austerity to slow down.

In this context, the treaty on economic cooperation is now being implemented by the six governments of the Gulf Council for Cooperation (GCC). The GCC economic treaty is more closely related to the development of a service economy in the region of the Gulf than it is to

[19]Alec Thomas, *op cit*, Ref 16.

a manufacturing based regional economy. Thus new business in Saudi Arabia will gradually cease to be totally dependent on new government contracts, and will become more and more interested in using Saudi Arabia's excellent infrastructure and very substantial capital base to create regionally oriented investment opportunities in the service industries.[20]

Problems in forecasting oil exports

Saudi Arabia's sustainable oil production capacity is currently about 10 million bbl/day. While there has been considerable speculation in the past that Saudi Arabia might increase sustainable capacity to 12 million bbl/day, or even higher, there are no indications that the development programme necessary for such an increase has been – or is likely to be – put into motion in the foreseeable future. What is more likely is that Saudi Arabia will engage in a limited programme to increase output from the oil fields producing medium and heavy crudes, thereby increasing total sustainable capacity by another 1 million bbl/day to 11 million bbl/day by 1990.[21]

A number of technical, political and market considerations have dictated a somewhat conservative approach to the development of Saudi Arabia's vast resource base.[22] These considerations similarly motivated the imposition of a production ceiling of 8.5 million bbl/day in the 1970s, with some deviation above the ceiling in the wake of the Iranian revolution and later the Iran–Iraq war. In the spring of 1982 Saudi Arabia's allowable level was lowered – at least temporarily – to 7 million bbl/day in support of the decision by the other twelve OPEC members to establish a production sharing programme. The higher 8.5 million bbl/day allowable production rate is expected to be restored as world demand for OPEC oil begins to recover. Given rising domestic oil consumption, an allowable of 8.5 million bbl/day would translate into oil export availability from Saudi Arabia of 7.7 million bbl/day in 1985 and 7.5 million bbl/day in 1990. Within this context, there are two sets of countervailing pressures affecting Saudi Arabia's oil policies. On the one hand Saudi Arabia is under constant outside pressure – real or perceived – to maintain a high or at least flexible allowable level. Much of this pressure comes from the USA which implicitly, if not explicitly, sets Saudi Arabia's 'moderation' on oil issues (defined as high production and low prices) as a precondition for its continued support for the present regime and for its guarantees of territorial integrity.

While Saudi Arabia now has a fundamental interest in the economic and political stability of the Western industrialized nations, it is also true that Saudi Arabia is not interested in destroying the economies of the industrialized world or their assets, the same being true of the other OPEC countries. Moreover, it is not clear that either a more aggressive Saudi Arabian policy on oil pricing or, alternatively, a more restrained policy on oil output would play havoc with the rest of the world. In any case, Saudi Arabia's interest in the economic well-being of other countries plays a minor role in determining its oil policies.[23]

Finally, as noted above, the argument is often made that Saudi Arabia's budget needs dictate large production levels. But these needs are often misunderstood and misinterpreted. In particular, the confusion between domestic currency and foreign exchange needs has created major overestimates of Saudi Arabia's oil revenue requirements.[24]

[20]Adda Gueciover, 'Problems and prospects of economic integration in the AGCC', *The Arab Gulf Journal*, October 1982, pp 43–54.

[21]Bijan Mossavar-Rahmani and Fereidun Fesharaki, *OPEC and the World Oil Outlook: Rebound of the Exporters?*, The Economist Intelligence Unit, London, 1983, Special Report No 140, p 45.

[22]Mossavar-Rahmani and Fesharaki, *op cit*, Ref 21, pp 46–47. For a more detailed analysis see Paul Barker, *Saudi Arabia: The Development Dilemma*, Economist Intelligence Unit, London, 1982, Special Report No 116.

[23]An excellent discussion of this point is given in William Quamt, *Saudi Arabia's Oil Policy*, Brookings Institution, Washington, DC, 1982, pp 23–42.

[24]Bijan Mossavar-Rahmani and F. Fesharaki, *op cit*, Ref 21, pp 46–47.

Saudi Arabian officials have hinted that, at prevailing prices, the present pace of development could be sustained with oil exports of just over 5 million bbl/day and exports could even go lower. In 1982 Saudi Arabia's return on its massive foreign assets approached $20 billion – equivalent to almost 2 million bbl/day in oil exports. Moreover, Saudi Arabia can slow down construction of numerous industrial and infrastructure projects with negligible impact on the economy since many of these projects are located in industrial enclaves with no real linkage to the domestic economy.

Saudi Arabia can also draw down its foreign reserves. In the event of this it is probably pointless to attempt to project Saudi Arabia's future oil export targets on the basis of revenue needs alone; annual budgets and five year development plans provide only broad, flexible guidelines and only rarely do the actual numbers even match.

However, external pressures for ever-rising Saudi Arabian oil exports at low prices are at least somewhat balanced by arguments for a less accommodating approach to oil policy.

While a revolution in Saudi Arabia similar to the one which occurred in Iran is considered unlikely at present, discontent, particularly among the educated middle classes, is apparent. Even within the royal family there are those who believe that the open embrace of the USA is not in the best interest of the country. The dissidents argue that the USA has been unwilling or unable to deliver a solution to the Palestinian problem and that Saudi Arabia's overt friendship with Israel's main ally destabilizes the regime and gives the appearance that Saudi Arabia is merely a US puppet. These groups do not necessarily advocate a break with the USA, but they do call for a more independent Saudi Arabian policy, of which reduced oil production and exports would be an important actual manifestation.

There are also other technical factors in favour of reducing oil output. First, Saudi Arabia's proven reserves of light oil are being depleted more rapidly than those of the medium and heavy varieties. The country has thus sought to change its historic export mix of around 65% light: 35% medium/heavy to an equal mix. In early 1982 a number of new sales and 'incentive crude' contracts were based on this newer 50:50 ratio. Achieving such a ratio would necessitate a reduction in total oil production to about 6–6.5 million bbl/day unless plans to increase heavy oil production were implemented on schedule. Second, Saudi Arabia's Master Gas System – a massive $20 billion natural gas gather project – cannot utilize associated gas output beyond an estimated 7.3 million bbl/day of oil output. Any additional output of associated gas would have to be flared and wasted.

On balance it appears that Saudi Arabia's preferred level of outline ouput or allowable will remain at the 8.5 million bbl/day level. The 8.5 million bbl/day allowable not only provides what is viewed as a reasonable compromise between the advocates of high and low production targets but has also taken on a momentum of its own.

Of course, if the present Saudi Arabian regime was replaced by one which was substantially different, production could be lowered significantly, at least initially. Subsequently, depending on political and economic priorities, it is not inconceivable that even a radically different regime might reinstate the previous production targets, much as the Islamic government in Iran will in all likelihood eventually do.

Mechanisms of growth

The manner in which exports act as a leading sector, and the determinants of the overall impact of changes in exports on national economies have been discussed in the literature for some time.[25] The concensus amongst economists seems to be that exports can contribute to economic growth through their direct contribution to gross domestic product, since they are included as part of GDP, and, indirectly, through linkages created with non-oil sectors in a sequence of multiplier accelerator mechanisms. Theoretically, these indirect contributions to the economy may continue to operate long after a particular change in exports has occurred.[26]

Thus, while the petroleum sector may not participate directly in the buying and selling of goods in the domestic market, as was historically the case for the leading export growth sectors, it may still act as they did in providing an engine of growth for the economy, rather than providing a direct effect through large backward and forward linkages. The mechanism may be one of a series of demand responses that result once the sector's revenues begin to interact with the rest of the economy.

In sum, the overall impact of a change in exports will depend on, first, changes in technology that result, second, the propensity to import, third, the extent to which investment opportunities are generated, fourth, the ability to attract foreign investors and, finally, other non-quantitative effects. Obviously, neither the exhibited nor the relative sizes of exports' direct and indirect contributions to the growth of the economy need to be fixed and could conceivably vary between different time periods. Clearly, if the opportunities generated by the growth of the export sector are exploited then a pattern of economic growth will evolve and will be characterized as a process of diversification about an export base.[27]

While the relationship between the growth of oil exports and the growth of GDP over time is central to an export base model of growth, the literature has never been specific as to the operational nature of this relationship; ie exactly what effect the time period or time pattern of changes in exports might have on income. The problem of determining the time lag between oil export growth and economic growth in Saudi Arabia must therefore be central to any econometric investigation that attempts to forecast the economy's likely growth path.

More precisely, to have any credibility at all a forecasting model of the Saudi Arabian economy must identify to what extent demand increasing effects stemming from petroleum revenues have induced movements in the country's indigenous (non-oil) income. Therefore, as a first step in constructing an econometric model of the economy, an attempt was made to statistically estimate the manner in which the oil sector has interacted with the rest of the economy.

Empirical formulation of export base theory

It is quite likely that because the government need not spend its oil revenues immediately after they accrue but can instead build up a foreign portfolio in order to sustain expenditures during years of falling revenues, oil exports will have an impact on GDP over time rather than instantaneously. One formulation would be to specify GDP in the

[25]See, for example, G.W. Bertram, 'The relevance of the Canadian wheat boom in Canadian economic growth', *Canadian Journal of Economics,* August 1973; and R.E. Caves, 'Export lead growth and the new economic history', in J. Bhagwati, *Trade, Balance of Payments and Growth, Essays in Honor of Charles P. Kindieberger,* North Holland, Amsterdam, 1971, pp 433–442.

[26]Raymond Mikesell, 'The contribution of petroleum and mineral resources to economic development', in Raymond Mikesell, ed, *Foreign Investment in the Petroleum and Mineral Industries,* The Johns Hopkins Press, Baltimore, 1971, pp 3–28.

[27]An exhaustive analysis is given in G. Nankani, 'Development problems of mineral-exporting countries', in World Bank, *World Bank Staff Working Paper No 354,* August 1979.

current period as depending not on exports during that period (year) but also on the series. This formulation implies that the impact of exports goes back a certain number of years,[28] ie:

$$GDPN = b_0 EXPTNA + b_1 EXPTNAL + b_2 EXPTNAL2 \ldots \quad (1)$$

where *GDNP* is GDP (current price), *EXPTNA* is nominal exports, *EXPTNAL* is exports lagged one year, *EXPTNAL2* is exports lagged two years, and so on.

In this form there are an indefinitely large number of parameters to be estimated – $b_0, b_1, b_2 \ldots$ This is clearly impractical if not statistically impossible. It is therefore necessary to make some simplifying assumptions. *A priori*, the most reasonable would be to assume that the impact on current GDP of previous exports declines exponentially, ie exports in period a have an impact b on GDP in period s but only impact ba in period $t+1$, $ba2$ in period $t+2$, and so on. This formulation implies that the impact of exports on GDP would decline over time in a systematic manner.

Using this framework Equation (1) can be written as:

$$GDNP = bEXPTNA + baEXPTNAL + ba2EXPTNAL2 \ldots \quad (2)$$

which can be simplied to a form easily estimated:[29]

$$GDNP = b(1-a) + bEXPTNA + aGDPNL \quad (3)$$

The value of b can be obtained from the estimated value of the intercept and a from the *GDPNL* term, where *GDNP* = GDP, and *GDPNL* = GDP lagged one year.

In addition to estimating the value of a using Equation (3), we can measure the impact on GDP due to a change in exports for both short- and long-term analysis. The impact multiplier measuring the instantanous effect of a change in exports on GDP is calculated by using b. It can be shown that the equilibrium multiplier or long-run multiplier measuring the change in equilibrium value of GDP due to a change in exports is calculated by:

$$b/(1-a)^{30} \quad (4)$$

The relationship of oil to GDP was calculated using this framework. For a number of theoretical reasons both GDP and exports were calculated as the percentage rate of change from year to year. Theoretically this function makes sense[31] because, firstly, the spread effects include acceleration effects and thus proper specification requires some concept of change and, secondly, we would not expect exports to have a constant impact on the economy over time (as the economy undergoes structural changes). The percentage annual change was approximated by taking the natural logarithm of the change from one year to the next in each variable.

The results for GDP for the period 1960–1978 were:

$$\ln(GDPN/GDPNL) = \underset{(194.76)}{0.7424 \ln(EXPTNA/EXPTNAL)} + \underset{(3.5710)}{0.1369 \ln(GDPNL/GDPNL2)} + 0.0248 \quad (5)$$

$r^2 = 0.9341 \qquad F = 99.1676$

with ( ) = partial F values, ln = natural logarithm and non-oil GDP (*NOXN*) for 1960–1978.

[28]From a general formulation elaborated on in M. Dutta, *Econometric Methods*, South Western Publishing Co, Cincinnati, 1975, Chapter 7.

[29]As proven in L.M. Koyck, *Distributed Lags and Investment Analysis*, North-Holland, Amsterdam, 1954.

[30]Dutta, *op cit*, Ref 28, p 189.

[31]Following M.M. Metwally and H.V. Tamaschke, 'Oil exports and economic growth in the Middle East', *Kyklos*, No 3, 1980, pp 499–521.

$$\ln(NOXN/NOXNL) = 0.1817\ln(EXPTNA/EXPTNAL) \underset{(1.5926)}{} + 0.819\ln(NOXNL/NOXNL2) \underset{(29.8601)}{} + 0.0015 \quad (6)$$

$r^2 = 0.6920$ $F = 15.7264$

For Equation (5), $b = 0.7424$ and $a = 0.1369$, yielding a long-run multiplier of 0.8602. For Equation (6), $b = 0.1817$ and $a = 0.8196$, yielding a long-run multiplier of 1.0072; ie for each dollar increase in oil exports, there is in the long run a corresponding \$1.0072 increase in non-oil GDP.

It should be noted that in Equation (5) the second term depicting the effect of past exports yielding the b multiplier is just barely significant at the 90% level by the partial F test.[32]

These results indicate that current exports are extremely important in determining GDP. The spread effects, however, are questionable. Perhaps a more meaningful result is that obtained when non-oil GDP is used in place of GDP. Non-oil GDP is highly significant by the F test in the regression equation, thus indicating that spread effects were in fact very important in Saudi Arabia during the period and that investment opportunities generated by the oil revenues were being exploited to advantage.

For the pre-1973 price increase period (1960–1973), the results were:

$$\ln(GDPN/GDPNL) = 0.6194\ln(EXPTNA/EXPTNAL) \underset{(22.4272)}{} + 0.1009\ln(GDPNL/GDPNL2) \underset{(0.1412)}{} + 0.0369 \quad (7)$$

$r^2 = 0.7149$ $F = 11.2842$

With the lagged export effect insignificant and for non-oil GDP:

$$\ln(NOXN/NOXNL) = 0.2015\ln(EXPTNA/EXPTNAL) \underset{(4.1966)}{} + 0.0463\ln(NOXNL/NOXNL2) \underset{(0.0142)}{} + 0.0761 \quad (8)$$

$r^2 = 0.3187$ $F = 2.1054$

For the pre-OPEC price increase period, the spread effects of oil exports were statistically insignificant, even taking a negative sign in Equation (8). Apparently, since 1973 the country has become much more efficient in channelling export derived revenues into productive investment.

To examine the hypothesis that exports stimulate the Saudi Arabian economy through a spread effect that takes place over a rather long period of time (as opposed to a very transitory stimulus), the export income relationship was specified as:

$$\ln(NOXNP) = B1 + b2\ln(E/E1) + b3\ln(E1/EL2) + b4\ln(E12/EL3) + b5\ln(EL3/E14) \quad (9)$$

where $E = EXPTNAR$ = current price exports deflated by the import price index. The advantage of this formulation is that it makes no presumption as to the pattern of weights used to determine the impact of past exports on real non-oil GDP ($NOXNP$).

Results of regressing both constant and current price non-oil GDP on lagged exports confirm the general results obtained above (see Table 1). For the constant price case, exports do not have a significant impact

[32]The use and significance of the partial F test is given in N.R. Draper and H. Smith, *Applied Regression Analysis*, John Wiley, New York, 1966, p 71.

Table 1. Impact of exports on non-oil GDP in Saudi Arabia.

	ln (*E/EL*)	ln (*EL/EL2*)	ln (*EL2/EL3*)	ln (*EL3/EL4*)	ln (*EL4/EL5*)	ln (*EL5/EL6*)	Interest	r^2	*F*	Equation
Constant prices										
ln(*NOXNP/NOXNPL*) =	0.0166 (0.01294)						0.1001	0.0076	0.1294	(10)
ln(*NOXNP/NOXNPL*) =	0.0242 (0.3052)	0.0254 (0.2036)					0.0923	0.0351	0.2544	(11)
ln(*NOXNP/NOXNPL*) =	0.0218 (0.3175)	0.0064 (0.3981)	0.1289 (9.1792)				0.0774	0.4519	3.2983	(12)
ln(*NOXNP/NOXNPL*) =	0.0095 (0.5173)	0.0206 (0.7189)	0.1131 (14.6695)	0.1036 (9.0429)			0.0602	0.7139	6.2371	(13)
ln(*NOXNP/NOXNPL*) =	0.0532 (0.6945)	0.0001 (0.9812)	0.1275 (20.3886)	0.0843 (12.4363)	0.0835 (5.5538)		0.0421	0.8375	8.0109	(14)
ln(*NOXNP/NOXNPL*) =	0.0929 (0.0009)	0.0381 (0.5027)	0.0463 (13.5029)	0.0620 (10.7391)	0.1140 (15.6837)	0.2960 (1.4533)	0.0068	0.8747	6.9804	(15)
Current prices										
ln(*NOXN/NOXNL*) =	0.1259 (0.5913)						0.1672	0.0356	0.5913	(16)
ln(*NOXN/NOXNL*) =	−0.0507 (0.9878)	0.5014 (13.2038)					0.0950	0.5034	7.0958	(17)
ln(*NOXN/NOXNL*) =	−0.0330 (1.4875)	0.3554 (27.4154)	0.3734 (15.2600)				0.0476	0.7863	14.7210	(18)
ln(*NOXN/NOXNL*) =	−0.0765 (4.8957)	0.4020 (100.7798)	0.2434 (63.2990)	0.3496 (50.3375)			−0.0009	0.9564	54.820	(19)

Note: NOXNP = real non-oil GDP; *NOXNPL* = real non-oil GDP lagged one year; *NOXNPL2* = real non-oil GDP lagged two years, etc.; *NOXN* = current price non-oil GDP; *E* = exports; real non-oil GDP is regressed on exports deflated by the import price index; current price non-oil GDP is regressed on undeflated exports.

until after two years; then they are significant for three and four year lags, but are insignificant for a lag of five years. Exports also decline in strength with lags of two, three and four years (Equation 14, Table 1).

For the current price case a similar pattern emerges, although exports have a significant impact on income after only a one year lag.

Also, the evidence of declining weights of past exports is not as strong as in the constant price case; ie exports lagged by one, two and three years have fairly similar coefficients (Equation 19, Table 1).

A somewhat different picture emerges, however, when exports are regressed on individual sector output (eg agriculture, etc). In this formulation exports were not significant in any of the equations using sector value added as the dependent variable. This indicates weak direct linkages, and means that these sectors' growth patterns were independent of fluctuations in exports. Manufacturing output, for example, may be largely of the import substitution variety, and thus responds to the general level of domestic demand. These findings may also indicate that the full potential of exports in stimulating an expansion of manufacturing output has not been fully exploited, perhaps because of insufficient domestic market size. An alternative explanation is that the overall results (using non-oil GDP) are significant, while the results for the individual sectors (whose values add up to the non-oil GDP total) are not significant simply because the lag structure is complex and somewhat staggered over time.

Again, at the aggregate level an analysis of capital stock and investment patterns shows a clear relationship with export changes over time.

$$\ln(FKP/FKPL) = 0.1495 \underset{(0.6210)}{\ln(E/EL)} + 0.7467 \underset{(15.0174)}{\ln(FKPL/FKPL2)} + 0.0224 \quad (20)$$
$$r^2 = 0.5658 \qquad F = 7.8192$$

where FKP = real capital stock (defined as the sum of total investment in year t + investment in the previous two years); E and EL = real exports (nominal exports deflated by the import price index) and lagged real exports, respectively. The ( ) terms are the partial F values.

$$\ln(FTINP/FTINPL) = 0.1905 \underset{(1.7497)}{\ln(E/EL)} + 0.4251 \underset{(3.4428)}{\ln(FTINPL/FTINPL2)} \quad (21)$$
$$r^2 = 0.2705 \qquad F = 2.5963$$

where $FTINP$ = real investment.

Current period exports are not significant determinants of either capital stock or investment, while the lagged export term is highly significant for the capital stock, but only significant at the 90% level for investment. Apparently, expansion of current exports is not necessary for the growth of capital and may indicate that the country has enough reserves to finance its current investment needs; ie that short-run fluctuations in export earnings need not impair the country's development plans.

These results also suggest that much of Saudi Arabia's capital accumulation takes place in industries whose output does not depend significantly on growth in exports (eg, infrastructure and/or investment in import substitutes for which demand is readily available). From what we know of the economy, it is also apparent that the results simply reflect the fact that much of the country's investment is in projects with very long gestation periods, such as those being undertaken at Jubail. Again there is always the possibility that some imported capital goods may not be fully utilized due to domestic market limitations. Clearly, for many industries even a massive expansion of exports would not be enough to give the required volume of sales or to create enough demand to justify the economic establishment of a good number of manufacturing industries.

It is possible that because these results were derived from current price data, they may exhibit an inflationary bias. To suppress the inflationary effect, the relationship between exports and both GDP and non-oil GDP was tested in constant prices (but allowing for improvements in the terms of trade).[33] Thus GDP was deflated with the GDP deflator (1970 = 100) and exports by an index of import prices. Deflating exports in this manner is preferable to using an index of export prices, since any rise in the price of exports relative to that of imports (ie an import bent in the terms of trade) reflects a true gain to the economy.[34]

For non-oil GDP, the results are similar to those above. For 1960–1978:

$$\ln(NOXNP/NOXNPL) = 0.0392 \underset{(0.3959)}{\ln(EXPTNAR/EXPTNARL)} + 0.4950 \underset{(4.4270)}{\ln(NOXNPL/NOXNPL2)} + 0.0452 \quad (22)$$
$$r^2 = 0.2562 \qquad F = 2.4114$$

[33]The following tests follow Metwally and Tamaschke, *op cit*, Ref 31.

[34]Y. Kurabayashi, 'The impact of changes in terms of trade on a system of national accounts: an attempted synthesis', *Review of Income and Wealth*, 1971, pp 285–97.

[35]See Paul Davidson, 'Causality in economies, a review', *Journal of Post Keynesian Economics*, Summer 1980, pp 576–584, for an excellent discussion of this point.

and for 1960–1973:

$$\ln(NOXNP/NOXNPL) = \underset{(1.7736)}{0.0807}\ln(EXPTNAR/EXPTNARL) + \underset{(0.1203)}{0.1419}\ln(NOXNPL/NOXNPL2) + 0.0825 \quad (23)$$

$r^2 = 0.1171$ $F = 0.5907$

with $NOXNP$ = real non-oil GDP, $EXPTNAR$ = real exports.

Again, the results are strikingly different, indicating that for real non-oil GDP (but not total GDP) the spread effects are quite significant. As with the current price case, this pattern appears to be a fairly recent phenomenon. If the 1960–1973 period is examined separately, the spread effect is not significant (the sign of the lagged non-oil income term is in fact negative).

Conclusions

Do the empirical tests prove that the country's oil revenues have created numerous incentives for the non-oil sector, and that that sector has responded in a manner which has generated spread and linkage effects through the economy? As is well known, statistical analysis can only be used to reject a hypothesis. Analysis of the sort presented above can never prove a hypothesis to be correct.[35] As such, the empirical results examined above go a long way in disproving the idea that the Saudi Arabian petroleum sector has had only a short-run, transitory stimulating impact on the domestic economy and that the country has not taken the least advantage of some of the investment possibilities made possible by the revenues generated by this sector. It appears that changes in the level of exports have a number of impacts on the non-oil sector of the economy which take some time to have their full effect felt.

The role of the government during the next few years is likely to continue to be constrained along the lines established during the Fifth Plan period:

- designing a domestic infrastructure network capable of supporting a modern industrial apparatus;
- implementing health, welfare and education policies necessary for maintaining the human element in the development process while at the same time contributing to improvements in labour and managerial quality;
- investing in selected heavy industries into which the private sector is reluctant to venture;
- guiding the future spatial configuration of population and economic activity through locational investment decisions.

The continued increasing role of government in the economy is simply a logical consequence of the development strategy already adopted by the government and the constraints facing Saudi planners. Government activity will continue to be directed toward economic activities which the private sector will be reluctant to enter into due to the risk involved or the size of the investment required.

In essence, the government will continue to face the basic problem of utilizing its petroleum revenues to support consumption; while ensuring that eventual self-sustained growth is achieved. This perception of Saudi Arabia's growth process will be incorporated into the forecasting model

through the separation of the petroleum sector from the remainder of the economy. As noted, linkages (forward and backward) between the petroleum industry and other sectors of the economy are minimal and, consequently, the influence of the economy on the petroleum sector is negligible, as is the direct influence of that sector on the rest of the economy.